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catalytic material, the catalytic material consisting essentially of bulk ceria having a BET surface area of at least about 10 m<sup>2</sup>/g, and Beta zeolite, the Beta zeolite optionally being doped with a cation selected from the group consisting of one or more of hydrogen and a catalytic moiety, with the provisos that (i) iron-doped Beta zeolite is excluded, and (ii) a catalytic metal selected from the group consisting of platinum and palladium is present in the composition.

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Please cancel withdrawn claims 59-70.

### **REMARKS**

#### **Restriction Requirements**

The Examiner has required restriction under 35 USC 121 to one of the following two inventions:

- I. Claims 39-58, drawn to a catalyst composition; and
- II. Claims 59-70, drawn to a method for treating a diesel engine exhaust stream.

Applicant's provisional election of Group I, claims 39-58, is affirmed. Claims 59-70 have been canceled, Applicants reserving the right to present those claims in a divisional application.

#### **Added Claim**

A new claim 71 has been added, claim 71 being semi-closed to exclude components which would affect the basic novel characteristics of the invention.

#### **Rejection of Claims Under 35 USC § 112**

Claims 39-58 have been rejected under 35 USC § 112, first paragraph, as containing subject matter which is not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that, at the time the application was filed, the inventors had possession of the claimed invention.

Specifically, the Examiner contends that the negative limitation "Beta zeolite other than iron-doped Beta zeolite" is not supported by the specification as filed, citing MPEP 2173.05(i) and *Ex parte Grasselli*, 231 USPQ 393 (Bd. App. 1983), *aff'd mem.*, 738 F.2d 453 (Fed. Cir. 1984).

MPEP 2173.05(i) provides that any negative limitation or exclusionary proviso must have basis in the original disclosure, and further states (in the last paragraph of the right-hand column at page 2100-202)

"If alternative elements are positively recited in the specification, they may be explicitly excluded in the claims. See *In re Johnson*, 558 F.2d 1008, 1019, 194 USPQ 187, 196 (CCPA 1977) ("[the] specification, having described the whole, necessarily described the part remaining."). See also *Ex parte Grasselli*..."

In this regard, the Examiner's attention is respectfully drawn to Applicant's specification as filed, page 3, lines 16-20, which reads as follows.

"Alternatively, or in addition, the zeolite of the catalyst composition may be doped, e.g., ion-exchanged, with a catalytic moiety such as one or more of hydrogen ion, platinum, copper, nickel, cobalt, iron, etc."

The Examiner's attention is also directed to Applicant's specification at page 13, lines 25-35, which reads as follows.

"Doped Metals or Hydrogen: The zeolite used may optionally be doped either by conventional acid treatment to convert the zeolite to the acid form or by conventional ion-exchange techniques to exchange catalytically active metal cations for cations of the zeolite, or by any other suitable technique which disposes the catalytic metal or metals or hydrogen within the pores of the zeolite. (Conventional acid treatment of a zeolite to convert it to an acid [hydrogen] form of the zeolite is, for economy of expression, referred to herein as doping the zeolite with hydrogen.)" (Emphasis added.)

It is clear from the foregoing that Applicant's specification at the time of filing clearly delimited the available cations as comprising either hydrogen or "catalytically active metal cations". Therefore, unlike the situation in *Ex parte Grasselli*, the exclusion of iron as the dopant does not imply the permissible inclusion of all other elements not so expressly excluded. Applicant's claims have been amended to further clarify this point by reciting that

the Beta zeolite is doped with a cation selected from hydrogen or catalytically active metal cations other than iron. In view of Applicant's specification as filed, including the portions quoted above and the wording of the claims, it is respectfully submitted that the present situation fits within the teachings of *In re Johnson, supra*, as set forth at page 196 in headnotes [10] and [11] of *In re Johnson*, a narrowing of the claims so that the claims embrace only a part of what was disclosed does not bring the claims within the proscription of 35 USC 112. In *In re Johnson*, the claims were narrowed in order to eliminate coverage of a count lost in an interference. In the present case, the claims have been narrowed simply to claim subject matter not claimed in a parent application from which this case was divided.

In view of the foregoing, it is respectfully submitted that the rejection under 35 USC 112 has been overcome.

#### **Rejection of claims under 35 USC § 103**

Claims 39-54 and 56-58 have been rejected under 35 USC 103(a) as being unpatentable over Abe '198 (US 5,296,198) in view of Hertl et al (US 5,284,638) and Wan et al (US 4,714,694).

**The Rejection.** Abe '198 is cited as teaching a process for the purification of exhaust gas utilizing a catalyst comprising a hydrocarbon adsorbent and additional catalytic material to reduce the nitrogen oxides present in the exhaust gas stream, the Examiner citing column 2, line 65 to column 3, line 7. The taught adsorbent is a high-silica zeolite that is exchanged with a noble metal such as platinum or palladium. The Examiner cites column 3, lines 36-42 as showing that additional catalytic material is a heat-resistant oxide containing at least one noble metal. Abe '198 is said to further teach that the zeolite is used to adsorb hydrocarbons from the relatively cool exhaust gas on start-up of the engine and that, as the temperature rises, the hydrocarbons are released from the zeolite and converted by the catalytic material, citing column 4, lines 24-40. Zeolites referred to include ZSM-5 and Y (column 5, lines 17-31). Abe '198 is further cited as teaching that the zeolite to be used should be the hydrogen type in view of the heat resistance of such zeolite types, citing column 5, lines 45-48.

Column 6, lines 39-48 are cited for the disclosure that a heat-resistant oxide such as alumina may be used, and that rare-earth oxides such as cerium [sic] should be used.

The Examiner further relies on column 6, lines 49-57 of Abe '198 for showing of quantities of noble metals which are said to overlap or encompass the claimed amounts, and column 9, lines 1-23 for the showing of use of a honeycomb monolith structure.

Finally, the Examiner directs attention to Example 3 of Abe '198, which is stated to show use of a zeolite in conjunction with cerium oxide and alumina oxide [sic] having a surface area of 200 m<sup>2</sup>/g.

The Examiner contends that the difference between Abe '198 and the rejected claims is that Abe '198 does not teach the claimed surface area of the bulk ceria or the use of Beta zeolite.

The Examiner seeks to remedy the acknowledged deficiency of Abe '198 by reliance upon Hertl '638, which is cited as teaching a catalyst system utilizing both a zeolite adsorbent and a heat-resistant metal oxide for use in exhaust gas treatment processes. Use in connection with the treatment of diesel engines is shown, citing column 3, line 27, and that the adsorbent used can be zeolite Beta, or ZSM-5 or Y, citing column 4, lines 41-44 and the Table at column 7. It should be noted that Hertl '638, at column 3, line 27 merely refers to the hydrocarbons treatable by its zeolite adsorbent as including those from diesel fuel (as well as gasoline and alcohols) and their products of combustion. Hertl '638 thus does not suggest that the material disclosed is by itself capable of treating diesel (or any) exhaust. As disclosed by the title, Abstract and, e.g., column 2, lines 29-40 of Hertl '638, the disclosed composition is for use in adsorbing hydrocarbons. As disclosed, e.g., at column 2, lines 52-60 of Hertl '638, a multi-stage system is provided, including a downstream catalyst for converting NO<sub>x</sub>, CO and hydrocarbons to innocuous products. The latter is what is usually referred to as a three-way conversion ("TWC") catalyst, and typically is used to treat the exhaust of gasoline-fueled engines. The zeolite of Hertl '638 is thus used only as a hydrocarbon adsorbent (at low temperatures) which releases the hydrocarbons when the gas is hot enough to be treated by a downstream catalyst. See column 4, line 20 to column 5, line 33. The Hertl '638 zeolite is thus disclosed only as a hydrocarbon adsorbent/release agent.

From this, the Examiner contends that it would have been obvious to one of ordinary skill in the art to have modified the invention of Abe '198 to include the use of zeolite Beta in light of the teachings of Hertl et al. The basis for this motivation is said to be because Beta is an art-recognized functionally equivalent adsorbent to the zeolites of Abe '198, and because the respective compositions of Abe '198 and Hertl et al are used in analogous processes, i.e., the purification of exhaust gases. The Examiner therefore concludes that "one would have a reasonable expectation of success from the combination."

**Traversal.** This ground of rejection is respectfully traversed.

At this point it should be noted that Abe '198 does not concern treatment of a diesel exhaust, but rather a catalytic heater for residential or industrial use. Wan '694 concerns the catalytic treatment of the exhaust of a gasoline-fueled engine.

One skilled in the art is aware that the requirements of catalysts for treating the exhaust from, respectively, gasoline-fueled and diesel-fueled engines, are quite different. The requirements for a catalytic heater are even further afield from those for a diesel exhaust treatment catalyst. The person skilled in the art is also aware of the notorious unpredictability of catalysts and catalytic reactions. A catalyst employed to treat the exhaust of diesel engines must deal not only with gas-phase pollutants such as gas-phase hydrocarbons, carbon monoxide, and nitrogen oxides, but with an aerosol of hydrocarbon liquids, sometimes referred to as the "soluble oil fraction" or "volatile oil fraction" ("VOF"), plus solid carbon particulates. In this regard, see the Applicant's specification at page 1, lines 18-28 and at page 1, line 29 to page 2, line 12, the latter concerning exacerbation of the soot particulate problem by the oxidation of  $\text{SO}_2$  to  $\text{SO}_3$ . It is clear that the treatment of diesel exhaust presents one skilled in the art with a different set of problems from that encountered in catalytic heaters or in treating the exhausts of gasoline-fueled engines. While the problems may overlap to a certain extent with respect to the treatment of the gas-phase pollutants of the diesel exhaust, the particulates and VOF provide problems unique to the treatment of diesel exhaust. Therefore, references such as Wan et al U.S. Patent 4,714,694 ("Wan '694") which concerns a catalyst for the treatment of gasoline-engine exhaust, see, for example, column 1, lines 8-57 of Wan '694, are not directly pertinent to the treatment of diesel exhaust. One skilled in the art would therefore not resort to teachings such as Wan '694 which are directed solely to the treatment of the exhaust of gasoline-fueled engines because of the unique problems presented in the treatment of diesel-engine exhaust. (It is noted that, as described at page 2, line 13 *et seq* of Applicant's specification, the use of zeolites in catalysts for the treatment of diesel exhaust is known in the art.)

Similarly, Abe '198 U.S. Patent 5,296,198 ("Abe '198") discloses a catalyst which is described as being useful as a heater for domestic use, such as a hot-air heater, or an industrial heater, such as one used as a pre-heater for control of automobile engine exhaust gas. Abe '198 requires the presence of the electrodes for preheating the catalytic heater. See, for example, paragraph (c) of the Abstract, and column 2, line 56 *et seq*, column 4, lines 29-38, and the claims of Abe '198. Abe '198, like Wan '694, is therefore not concerned with diesel-engine exhaust treatment, and one skilled in the art would not be expected to resort to

the teachings of these references to address the problems associated with diesel-engine exhaust treatment, and not with heaters or automobile (gasoline) fueled engines with which the cited references are concerned.

Wan '694 is relied upon as teaching that a beneficial catalyst carrier can be produced by using alumina having a surface area meeting that recited in the claims, in combination with bulk ceria having the required surface area, citing column 10, lines 1-35 and the Examples. The showing of platinum supported by the composition is noted, as is the teaching that the catalyst composition is effective for the oxidation and reduction of components found in the exhaust gas emanating from diesel engines.

The Examiner therefore concludes that it would have been obvious to one of ordinary skill in the art to have further modified the invention of Abe '198 to include the use of a cerium oxide component as claimed in view of the teachings of Wan '694. Again, the motivation to make this combination is said to be because of the alleged disclosed functional equivalence of the ceria-alumina-noble metal catalyst of Wan et al and Abe '198. Because both catalyst compositions can be used in the purification of exhaust gas, the Examiner again contends that "one would have a reasonable expectation of success from the combination."

This ground of rejection is respectfully traversed.

As noted above, neither Wan '694 nor Abe '198 is concerned with the treatment of diesel exhaust. Abe '198 is not concerned with the purification treatment of gases at all, but only with a catalytic heater utilizing electricity for pre-warming. The only reference in Abe '198 to gas treatment is use of the catalytic heater to pre-warm gases to be fed to a treatment catalyst. The Examiner has thus selected features from one reference dealing with an electrified catalytic heater, whether for home or industrial use, or as a pre-heater element in an automobile engine exhaust system (Abe '198), and another reference concerned with a catalyst for the treatment of the exhaust of a gasoline-fueled engine (Wan '694). The Examiner's resort to one reference from the field of catalytic heaters and another reference from the field of gasoline-engine purification catalysts, strongly suggest that the combination of references is an improper one based on so-called hindsight reasoning, and therefore not capable of sustaining a rejection under 35 USC 103.

It is not necessary to cite case law supporting the proposition that the Examiner is entitled to rely upon that which would be within the skill level of the pertinent art to make a proper combination of references under 35 USC 103. It is when the combination of references is suggested solely by the Applicant's disclosure that that combination is deemed

to be based on hindsight reasoning and therefore incapable of sustaining the rejection. It is respectfully submitted that the latter situation obtains here. The problems of treating the volatile oil fraction ("VOF") and carbon particulates found in diesel exhaust, and the exacerbation of the carbon particulates problem by condensation of liquids such as sulfuric acid and VOF onto the particles, obtain only in the field of treatment of diesel exhaust and not in the field of catalytic heaters or the field of treatment of gasoline-engine exhaust. This being so, it seems clear that the examiner is led to the particular combination relied upon solely by Applicant's disclosure, inasmuch as one skilled in the art would not look to the fields of catalytic heaters or gasoline-engine exhaust treatment for solutions to the far more intractable problems of treating diesel exhaust.

**Overlapping Ranges Issue** With respect to the encompassing and overlapping ranges noted earlier in the office action, the Examiner cites *In re Boesch*, 205 USPQ 215, for the proposition that the selection of particular ranges lying within the prior art's range is *prima facie* obvious. The Examiner also cites *In re Malagari*, 182 USPQ 549 for the proposition that ranges of components overlapping with the prior art are *prima facie* obvious.

**Traversal** This ground of rejection is respectfully traversed.

In the last paragraph on page 5 of the office action, the Examiner refers to the teaching of Abe '198 showing the amount of zeolite-to-oxide material ratio, and total noble-metal loadings at values which "overlap or encompass the amounts of materials instantly claimed." In the first paragraph at the top of page 6, the Examiner acknowledges that Abe '198 does not teach the claimed surface area of the bulk ceria present, or the use of Beta zeolite. A further deficiency of the reference is that, as noted above, Abe '198 is concerned with a catalytic heater and not a gas treatment catalyst. Further, the Examiner has selected from a list which the Examiner acknowledges is deficient as showing neither the use of Beta zeolite nor the surface area of the bulk ceria, and relies upon a disclosure of the proportion of a non-Beta zeolite and noble metal as rendering obvious the rejected claims. Where but in the Applicant's disclosure is there a suggestion to focus on that particular ratio disclosed in Abe '198 for a diesel exhaust treatment catalyst? The answer is nowhere, and this further illustrates the deficiency of the reference. It is pointed out that the case of *prima facie* obviousness in *Malagari* resulted in the claims' being rejected because the

"claimed invention is *prima facie* obvious over prior patent whose process is similar and where applicant's claimed range in starting

material touches that in the typical preferred range of reference inasmuch as applicant has not rebutted this prima facie case by establishing existence of unexpected properties in range claimed or by showing that the art in any material respect taught away from use of claimed range." (Emphasis added.)

Similarly, in *In re Boesch*, both the claims and the applied references dealt with compositions of nickel-base alloys, and the appellant sought to distinguish on the basis of a calculated value of "average electron vacancy concentration per atom in the matrix of the alloy."

The present situation differs from that in *In re Malagari* and *In re Boesch* because the respective materials are not similar. Abe '198 is concerned only with a catalytic heater which serves to heat air or some other gas. The Applicant's claims are concerned with the treatment of the exhaust of a diesel gas to reduce the noxious pollutants contained therein.

In contrast, the *Malagari* applicants claimed a process for producing grain-oriented silicon steel, and the references relied upon related to silicon steels identical in every respect except for the initial carbon content. As set forth at page 550 of 182 USPQ, the court stated that

"As noted by the board, appellant "conceded that, except for the range of carbon specified in step (a) of claim 14, the process defined by the claims is precisely disclosed in the references as applied by the examiner and was employed in the industry prior to the filing date of the involved application." Goss relates to silicon steels similar to appellant's in all respect except for the specified initial carbon content. ...Crede, in a similar format, contains a table giving "typical preferred range" and "typical specific analysis" for his silicon steel, which is produced according to a process closely analogous to that of appellant." (Emphasis added.)

As noted above, in *In re Boesch*, similar nickel alloys were at issue.

The present situation clearly distinguishes from that in *In re Malagari* and *In re Boesch*, inasmuch as the references relied upon deal with catalytic fields entirely removed from, and not concerned with, the treatment of diesel exhaust.



Further, regardless of the specific proportions of components present, claim 45, being dependent from a claim which, for the reasons given above, is believed to be in condition for allowance, is likewise in condition for allowance.

**Rejection of Claim 55 Under 35 USC 103(a)**

Claim 55 has been rejected under 35 USC 103(a) as being unpatentable over Abe '198 in view of Hertl et al and Wan et al as applied to claims 39-54 and 56-58 above, and further in view of Abe '198 5,164,350.

The Examiner relies on the earlier-cited references as applied above and states that the "difference between the modified disclosure of Abe '198. '198 and the claims is that the modified disclosure of Abe '198. '198 further does not teach the instantly claimed layer structure."

The Examiner contends that it would have been obvious in view of the teachings of Abe '198 '350 to utilize the layered arrangement shown therein, the Examiner again citing that motivation to use the layered structure emanates from the fact that the catalyst of each reference is functionally and analogous, i.e., both are directed to exhaust gas purification catalysts containing zeolite loaded with noble metal used in conjunction with a heat resistant oxide material also loaded with noble metal.

This ground of rejection is respectfully traversed.

Applicant does not rely upon the layered construction for imparting patentability to the claimed invention, but respectfully submits that claim 55 is allowable based on the fact that it depends from a claim which is believed to be in condition for allowance. Claim 55 will stand or fall with the claims from which it ultimately depends.

In view of the foregoing, reconsideration and withdrawal of the rejection, and allowance of the claims pending in the application is respectfully requested.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "V. E. Libert", written over a horizontal line.

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